# Critical Spares Initiative

09 May 2013

# OBJECTIVE / STRATEGY

- Sustain system reliability and availability during GCL ten-year overhaul and beyond.

- Ensure that the region has adequate depth of spares to minimize outages.

- Reduce risk to system reliability, availability and flexibility.

# IMPLEMENTATION / TACTICAL

- Develop listing of required spares based upon priority, lengthy procurement and strategic role of each project – both expense & capital.

- Need to Determine :
  - Which items are capital and or expense funded?
    - Which items to be funded by routine expense or NREX?
  - What makes sense for procurement plans (i.e. regional, or separate procurement contracts)?
  - What is the timing for funding?

# APPROACH

- Queried the Districts for critical spare needs. Oct 2011
- HDC created a summary listing. Nov 2011
  - Created outages>1mo., long lead to acquire, not funded by routine expense i.e. large capital or NREX.
- Districts reviewed summary listing. Dec 2011-Jan 2011

- Identified high risk areas of most exposure
  - Bushings
  - Spare transformers
  - Bearings

- Initiated actions to mitigate risk
  - Bushing Inventory update
  - Spare Transformer Study Update
  - Inventory Bearings
  - Priority List integration with project hoppers

# ACTIVITIES TO DATE

- Recommendations:
  - a. LCAP Pgm Mgrs, Project Reps and projects to assess Priority listing for funding.
  - b. 2002 Transformer Sparing study should be updated along with the regional bushing inventory.
    - Regional contracts don't make sense for transformer bushings (order by part #).
    - See if regional contracts makes sense if procure more transformers.
  - c. Verify spare bearings onsite.
  - d. Bearing condition should be verified for repair.
    - Per HDC: A regional contract (have districts issue task orders) may make sense if qualify guide and thrust bearings repair contractors separately.
- Action Underway - Priority bushings – JDA & Snake projects.
  - 13 months (2nd quarter FY 13).
  - NWW issued solicitation for four 500kv bushings.
  - NWP issued solicitation for one 500kv bushing.

# Recommendations from Surveys & Study

*Bearings*

# Recommendations from Surveys & Study
## *Bearings Recommendations*

**Most of the project sites indicated that their spare bearings are in working condition**.

- 4 out of the 20 sites indicated that spare bearings are needed.
  - Dexter
  - Lost Creek
  - Ice Harbor
  - Lower Granite

- 5 out of the 20 sites indicated that repair work was needed on their spare bearings.
  - Bonneville 1&2
  - John Day
  - Ice Harbor
  - Lower Granite
  - McNary

# Recommendations from Surveys & Study

## *Bearings Recommendations*

**Unused spares should be examined and have UT performed before being put into service.**

**Total FCRPS Exposure for Bearing Acquisition/Repair**

- Acquire new bearings = $1.3 million
- Repair existing spares = $2.4 million

# Recommendations from Surveys & Study

## *Bushings*

# Recommendations from Surveys & Study

## *Bushings Recommendations*

**13 out of 20 project need spare bushings.**

- Cougar
- Detroit
- Dexter
- Dworshak
- Foster
- Ice Harbor
- John Day
- Libby
- Little Goose
- Lost Creek
- Lower Monumental
- The Dalles

**Total FCRPS Exposure = $1.7 million**

# Recommendations from Surveys & Study
## *Bushings Recommendations – cont'd*

- Assumptions
  - Assumed that one spare bushing is required for each bushing type at each project. **At larger projects more than one spare may be justified.**
  - Determined requirements by inventorying installed bushings and existing spares
  - Assumed no sharing of bushings between projects. It is possible that there could be some sharing but it is not likely to be significant.
- Actions
  - BPA-TS has existing contracts with ABB – technical specifications will need to be provided. Depending on type < 12 months. Lead time.
  - Bushings have been ordered for JDA and Snake Projects – expected delivery date is Jan 2013.

# *Transformer Sparing Update*

# Recommendations from Surveys & Study Transformer Sparing Update – *cont'd*

## Previous Study Work

- 2002 Study Methodology
  - Determine transformer condition using amalgamation of industry practices
  - Determine energy revenue lost as a consequence of failure
    - Difference between 3 month outage and an 18 month outage
  - Simple estimate for probability of failure based on condition
  - Rank transformer families using B/C ratio

# Recommendations from Surveys & Study
# Transformer Sparing Update – *cont'd*

## 2012 Update

- Follow same approach as 2002 study, but
  - Account for Transformer Population Changes
    - 29 new transformers
  - Update Condition Assessment to use HydroAMP database information
  - Update "Install spare" and "Procure/install" times
  - Update replacement transformer costs
  - Update revenue lost (energy costs)
  - Use more rigorous reliability probabilities

# Recommendations from Surveys & Study Transformer Sparing Update – *cont'd*

## Results

- Prioritized Sparing and Placement Plan
  - Emergency Failure Plans for each transformer family
  - Recommended Spare Storage Site where applicable

- Ranking of Projects for which Spare Transformers Appear Justified
  - Two groups
    - Those without spares now
    - Those with a spare where another may be justified

# Recommendations from Surveys & Study Transformer Sparing Update – *cont'd*

## Results (con't)

- Procure spare transformers for these projects: (listed in decreasing B/C ratio)
  - McNary 230kV (no spare was purchased when transformers replaced)
  - The Dalles 230kV (single phase T2-T7 family)
    - B/C ratio drops if T3, and T5-T7 are replaced as planned
  - Bonneville Powerhouse 1 230kV (single phase)
  - The Dalles 115kV (T1 and T2)
    - B/C ratio drops if T1 is replaced as planned

# Recommendations from Surveys & Study Transformer Sparing Update – *cont'd*

## Other Results

- John Day and T1 at the Three L's
  - One spare phase for 21 transformers
  - Serviceability of spare phase is indeterminate
    - Transformer not "dressed out" so it can't be fully tested
  - If spare is not serviceable, John Day and T1 at the Three L's transformer family has the highest B/C ratio.
  - As noted in 2002 study, spare should be assembled and tested to ensure serviceability

# Recommendations from Surveys & Study

## *Updated Spare Transformer – Recommendations*

Assumptions:

- To install an existing spare transformer that is stored on site is estimated to require an outage of approximately 4 months.
- Based on recent transformer procurements, the time to procure and install a new transformer to replace a failed transformer is estimated to be 24 months.

Preliminary as of 24 Sept 2012

| Category A - Projects where one or more spare transformers appear justified and none exists | B/C Ratio | hydroAMP | Est Cost of Spare |
|---|---|---|---|
| McNary 230kV | 16.24 | 10/no spares | $1,200,000 |
| The Dalles 230kV (single-phase, existing units) | 13.54 | 4.7 | $1,200,000 |
| Bonneville PH1 230kV (no transfer bus) | 3.42 | 9.2 | $1,100,000 |
| Bonneville PH1 230kV (transfer bus) | 1.53 | 9.2 | $1,100,000 |
| The Dalles T1 (existing units) | 1.22 | 5.2 | $1,100,000 |

| Category B - Projects where one or more spare transformers appear justified and one exists | B/C Ratio | hydroAMP | Est Cost of Spare |
|---|---|---|---|
| Little Goose, Lower Granite, Lower Monumental T1 | 60.94 | 8.8 | $2,800,000 |
| Chief Joseph 230kV | 44.67 | 10.0 | $1,800,000 |
| John Day | 41.26 | 6.7 | $2,800,000 |
| Chief Joseph 500kV, T5-T6 | 27.11 | 8.4 | $2,100,000 |
| Detroit | 17.60 | 6.4 | $800,000 |
| Little Goose, Lower Granite, Lower Monumental T2 | 12.92 | 8.8 | $1,600,000 |
| Dworshak 500kV | 12.86 | 7.2 | $2,200,000 |
| Chief Joseph 500kV, T7 | 5.14 | 8.4 | $1,700,000 |
| Libby (3phase) | 1.40 | 7.2 | $4,700,000 |

# CRITICAL SPARES INITIATIVE TEAM

| Agency | Corps | Corps - LCAP | BPA |
|---|---|---|---|
| NWP | Dan Henriod/Tim Seeman | Harley Grosvenor | George Brown |
| NWS | Gary Brouse | Dennis Radunzel | Sandra Takabayashi |
| NWW | Kimberley Oldham | Jeff Sedgwick | Jack Kolze |
| HDC | Mike Berger | | |

| Project | Representative | Project | Representative |
|---|---|---|---|
| John Day | Dennis Stocks | Albeni Falls | Troy Vandenbark |
| The Dalles | Mike Colesar | McNary | Charlie Mack |
| Bonneville | Rick Mettler | Ice Harbor | Seth Thompson |
| Willamette Valley | Tom Voldbaek | Lower Monumental | Joseph Chandler |
| Rogue River | Bob Turk | Little Goose | James Mahaffey |
| Chief Joseph | James Boag | Lower Granite | Ben Feider |

| HDC Tasks April - Sept 2012 | Lead | Primary |
|---|---|---|
| Transformer Sparing Strategy Update | Scott Cotner | Maggie Watkins |
| Bearing Inventory | Dan Ramirez | EIT |
| Bushing Inventor | Mike Berger | EIT |

# QUESTIONS?

# Remaining Agency Treasury Borrowing Authority: Flat Annual 10 Percent Reduction Compared to Shaped Reduction